

Automated Control System for Alcohol and Pollution Detection in Vehicles

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Abstract: Now a day, due to status symbol everyone is trying to purchase their own four wheelers. All the vehicles run by Petrol, Diesel, and CNG etc. Mostly the people prefer the AC vehicle, in these vehicles “ the rate of fuel consumption is high and also extracting huge amount of heat from the atmosphere. It often happens during rainy season, in heavy traffic area the pollution level is very high if the engine is ON for long time the vehicles are on standing mode. Then due to this reason the toxic gas is emitted inside the vehicle that is injurious to the health of human. In this paper, we are planned to alcohol sensor inside the vehicle and avoid drunken drive. Sometimes during the long drive or whole night driving driver may feel sleepy which is also dangerous for passengers, through the alcohol sensor system if the count is less, then auto alarm which may indicate the toxic gas, smoke level through alarm sound must be made alert for drivers and passengers. And if the driver is drinking then through the control unit the vehicle door is not opening and if door is not locked then engine is not ignited. The aim of this paper is to detect driver behavior using alcohol sensor and pollution gas level using CO₂ sensor. In the proposed system alcohol and CO₂ sensors are used for driver behavior and pollution detection of the vehicle respectively. GPS will track the vehicle when vehicle is in danger situation. The values of the alcohol and CO₂ sensor are displayed on LCD. LCD will show the each and every action of the proposed system.

Keywords: Alcohol Sensor, CO₂ Sensor, GPS and LCD.

I. INTRODUCTION

The vehicle accident is a major public problem in many countries, particularly India. Despite awareness campaign, this problem is still increasing due to rider's poor behaviors such as speed driving, drunk driving, riding without sufficient sleep, etc. The numbers of death and disability are very high because of late assistance to people who got the accident. These cause huge social and economic burdens to people involved. Therefore, several research group and major motorcycle manufacturers have developed safety devices to protect riders from accidental injuries. However, good safety device for vehicles is difficult to implement and very expensive [1]. On the roadway driver usually keep a safety distance from one another. On the other hand, due to the driver's interruption, long-time driving tiredness, or a sudden break applied by another car, a serious collision may occur. Even though the driver is in a conscious mind, he cannot respond immediately to control his/her vehicle. Sometimes crash may occurs due to bad weather situations as mist, vapor, fog and so on. Therefore, with the help of obstacle detection and distance measurement sensor, a front end collision warning system is developed to prevent vehicle from the collision is named as VVCAU [2]. Many cases remain pending due to unknown reason of an accident. A sensor is a converter that measures a physical quantity and converts it into a signal which can be read by an observer or

by an (today mostly electronic) instrument. For example, a mercury-in-glass thermometer converts the measured temperature into expansion and contraction of a liquid which can be read on a calibrated glass tube. A thermocouple converts temperature to an output voltage which can be read by a voltmeter. For accuracy, most sensors are calibrated against known standards.

Sensors are used in everyday objects such as touch-sensitive elevator buttons (tactile sensor) and lamps which dim or brighten by touching the base. There are also innumerable applications for sensors of which most people are never aware. Applications include cars, machines, aerospace, medicine, manufacturing and robotics. A sensor is a device which receives and responds to a signal when touched. A sensor's sensitivity indicates how much the sensor's output changes when the measured quantity changes. Vehicle accidents are most common if the driving is inadequate. These happen on most factors if the driver is drowsy or if he is alcoholic. Driver drowsiness is recognized as an important factor in the vehicle accidents. It was demonstrated that driving performance deteriorates with increased drowsiness with resulting crashes constituting more than 20% of all vehicle accidents. But the life lost once cannot be re-winded. Advanced technology offers some hope avoid these up to some extent. The aim of this paper is to

detect driver behavior using alcohol sensor and pollution gas level using CO₂ sensor. In the proposed system alcohol and CO₂ sensors are used for driver behavior and pollution detection of the vehicle respectively. Whenever the sensors values cross the predefined values then the buzzer will indicate the danger situation.

II. HARDWARE OF VEHICULAR SYSTEM

The block diagram of the design is as shown in Fig.1. It consists of power supply unit, microcontroller, CO₂ sensor, alcohol sensor and LCD. The brief description of each unit is explained in below section.

Block Diagram Of Proposed System:

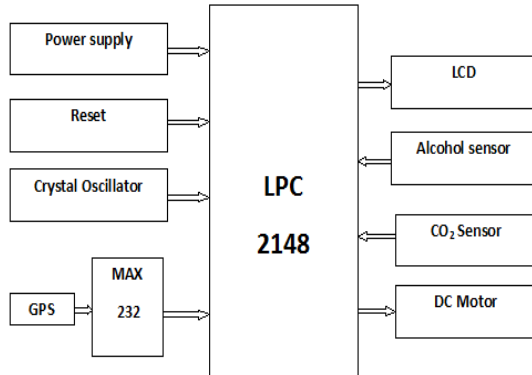


Fig.1. Proposed system block diagram.

A. GPS Module

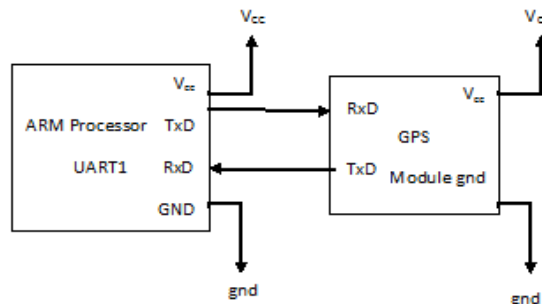


Fig.2. Interfacing of GPS module with ARM Processor on UART1.

With the evolvement of semi-conductor sensors for detecting the various gases, this project aims at using those semi-conductor sensors at the emission outlets of vehicles which detects the level of pollutants and also indicates this level with a meter. When the pollution/ emission level shoots beyond the already set threshold level, there will be a buzz in the vehicle to indicate that the limit has been breached and the vehicle will stop after a certain period of time, a cushion time given for the driver to park his/her vehicle. After this time period, the GPS starts locating the place of the vehicle. After the timer runs out, engine will be off. The synchronization and execution of the entire process is monitored and controlled by a micro controller. This project, when augmented as a real time project, will benefit the society and help in reducing the air pollution. The coding was

written in embedded C language and compile using keil compiler. The relevant hex file was dumped into the microcontroller using FLASH MAGIC software.

Global Position System (GPS)[1] is a space-based satellite navigation that provides location and time information in all weather conditions, anywhere on or near the Earth. GPS Receiver MT3318 Module is used that have a active patch antenna from Cirocomm. The GPS receiver tracks 51satellites simultaneously. The module is mounted on the PCB along with the 3.3V low drop voltage regulator, transmit, receive and power indication LEDs, Schmitt trigger based buffer for 5V to 3.3V logic level conversion. This GPS receiver gives data output in standard National marine electronics association (NMEA) format [5]. The GPS receiver gives -157dBm tracking sensitivity. The module is configured at 9600 baud rate. Module requires a 5V supply and can be interfaced with the 5V TTL / CMOS logic. The detail NMEA protocol:

GPGLA - Global Positioning System Fix Data.

GPGLA - GPS DOP and active satellites.

GPGLV - GPS Satellites in view.

GPRMC: Recommended minimum specific GPS/Transit data Speed.

GPVTG: Track Made Good and Ground758.

Fig.2 shows interfacing of GPS module with ARM Processor on UART1where TxT pin of ARM processor is connected to RxT pin of GPS module and vice versa. The data from GPS receiver in NMEA format is received on ARM processor using UART1 protocol which contains information about Vehicle position (longitude, latitude) and speed.

B. CO₂ Sensor

In this paper, gas sensor is used for CO₂ detection. It is high sensitive to carbon monoxide, simple drive circuit, stable and long life. If the level CO₂ from smoke emitted from car is more than the desired level, gas sensor sends signal to microcontroller. The output of CO₂ is given to one of LPC2148 pin and message is displayed on LCD.

C. Alcohol Sensor

In this paper, gas sensor is used for alcohol detection. It is high sensitive to alcohol, simple drive circuit, stable and long life. If driver has drunk, then alcohol sensor sends signal to microcontroller. The output of alcohol sensor is given to one of LPC2148 pin and message is displayed on LCD.

D. ARM7 Processor

The conventional 8 and 16bit Microcontrollers has its deficiencies when compared with 32bit microcontroller. This proposed system design uses the ARM processor.ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers. This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core. The Philips LPC2148 which is

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based on 32 bit ARM7 TDMI core supporting real time simulation. When ARM processor combined with RTOS with timing constraint can be realized for the data acquisition and transmission of data with high precision.

III. FIRMWARE IMPLEMENTATION

A. Firmware Implementation

Firmware implementation deals in programming the microcontroller so that it can control the operation of the IC's used in the implementation. In the present work, we have used the Orcad design software for PCB circuit design, the Keil μ V4 software development tool to write and compile the source code, which has been written in the C language. The Flash magic programmer has been used to write this compile code into the microcontroller.

Software Tools Required:

- Orcad
- Keil μ Vision4
- Flash Magic

Orcad is used for drawing the schematic diagram, it is mentioned above. Keil μ V4, Flash magic are the two software tools used to program microcontroller. The working of each software tool is explained below in detail.

Programming Code Description:

A compiler for a high level language helps to reduce production time. To program the LPC2148 microcontroller the Keil μ V4 is used. The programming is done in the embedded C language or Assembly language. Keil μ V4 is a suite of executable, open source software development tools for the microcontrollers hosted on the Windows platform. One of the difficulties of programming microcontrollers is the limited amount of resources the programmer has to deal with. In personal computers resources such as RAM and processing speed are basically limitless when compared to microcontrollers. In contrast, the code on microcontrollers should be as low on resources as possible.

Keil Compiler: Keil compiler is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.

The compilation of the C program converts it into machine language file (.hex). This is the only language the microcontroller will understand, because it contains the original program code converted into a hexadecimal format. During this step there are some warnings about eventual errors in the program. If there are no errors and warnings then run the program, the system performs all the required tasks and behaves as expected the software developed. If not, the whole procedure will have to be repeated again. Below figs.3 and 4 shows the compilation of the program.

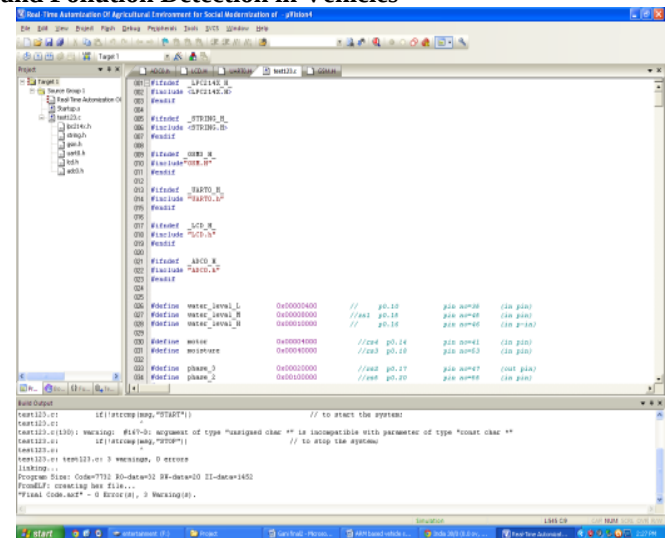


Fig.3. Compilation of source Code.

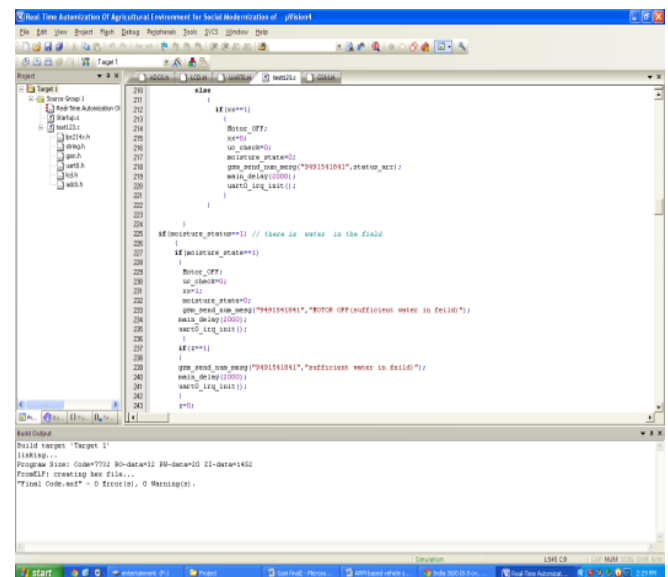


Fig.4. Run process of compiled Code.

B. Flash Magic

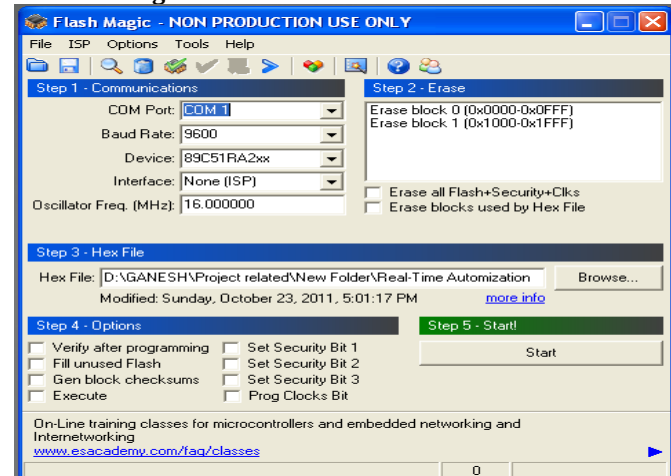


Fig.5. Dumping of the code into Microcontroller.

Flash Magic is a PC tool for programming flash based microcontrollers from NXP using a serial or Ethernet protocol while in the target hardware. The figures 8 and 9 below show how the baud rate is selected for the microcontroller, how are the registers erased before the device is programmed.

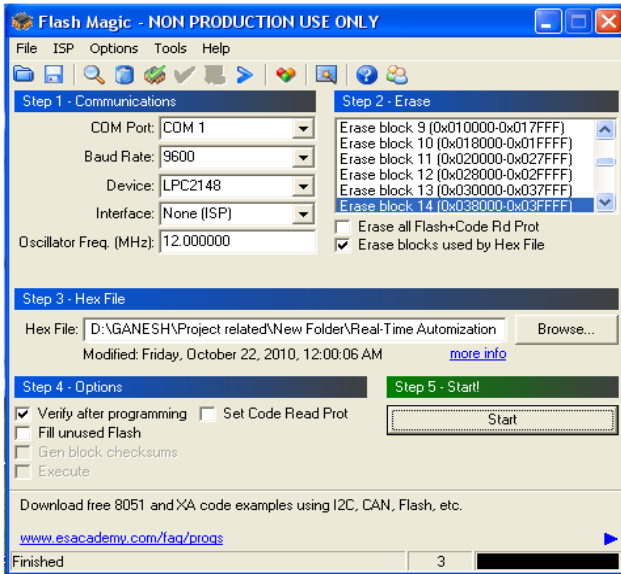


Fig.6. Dump process finished.

If dumping process of the hex file is completed, then the controller will work as per our requirement.

IV.RESULTS

The proposed system using ARM7 controller was designed and checked successfully the results are shown below Figs.7 to 10.

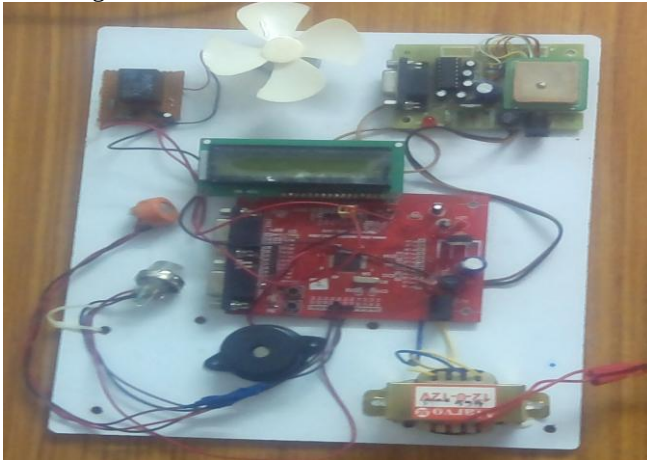


Fig.7. Proposed system.

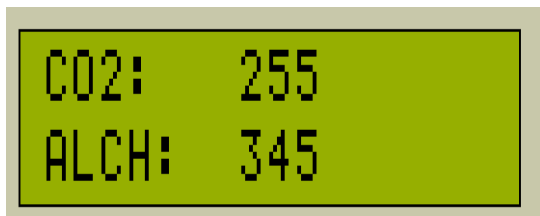


Fig.8. Indicating Sensors values.



Fig.9. Identification when pollution detected.



Fig.10. Indication when alcohol detected.

V. CONCLUSION

The implementation of is Automated Control System for Air Pollution Detection and driver behavior detection in Vehicles and done successfully. The communication is properly done without any interference between different modules in the design. Design is done to meet all the specifications and requirements. Software tools like Keil Uvision Simulator, Preload to dump the source code into the microcontroller, Or cad Lite for the schematic diagram have been used to develop the software code before realizing the hardware. Circuit is implemented in OrCAD and implemented on the microcontroller board. The performance has been verified both in software simulator and hardware design. The total circuit is completely verified functionally and is following the application software. It can be concluded that the design implemented in the present work provide portability, flexibility and the data transmission is also done with low power consumption.

VI. REFERENCES

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